



(12) UK Patent (19) GB (11) 2 390 597 (13) B

(45) Date of publication: 16.11.2005

(54) Title of the invention: Material handling apparatus

(51) Int Cl⁷: E04G 21/16, B66F 11/04

(21) Application No: 0215686.7

(22) Date of Filing: 08.07.2002

(60) Parent of Application No(s)
0517925.4 under Section 15(4) of the Patents
Act 1977

(43) Date A Publication: 14.01.2004

(52) UK CL (Edition X):
B8J J10 J15 J18 J19B J4 J7A

(56) Documents Cited:
GB 2358012 A EP 1336702 A
WO 1995/025210 A1

(58) Field of Search:
As for published application 2390597 A viz:
UK CL (Edition V) B8J
INT CL⁷ B66F, E04G
Other: ONLINE : WPI, EPODOC, JAPIO.
updated as appropriate

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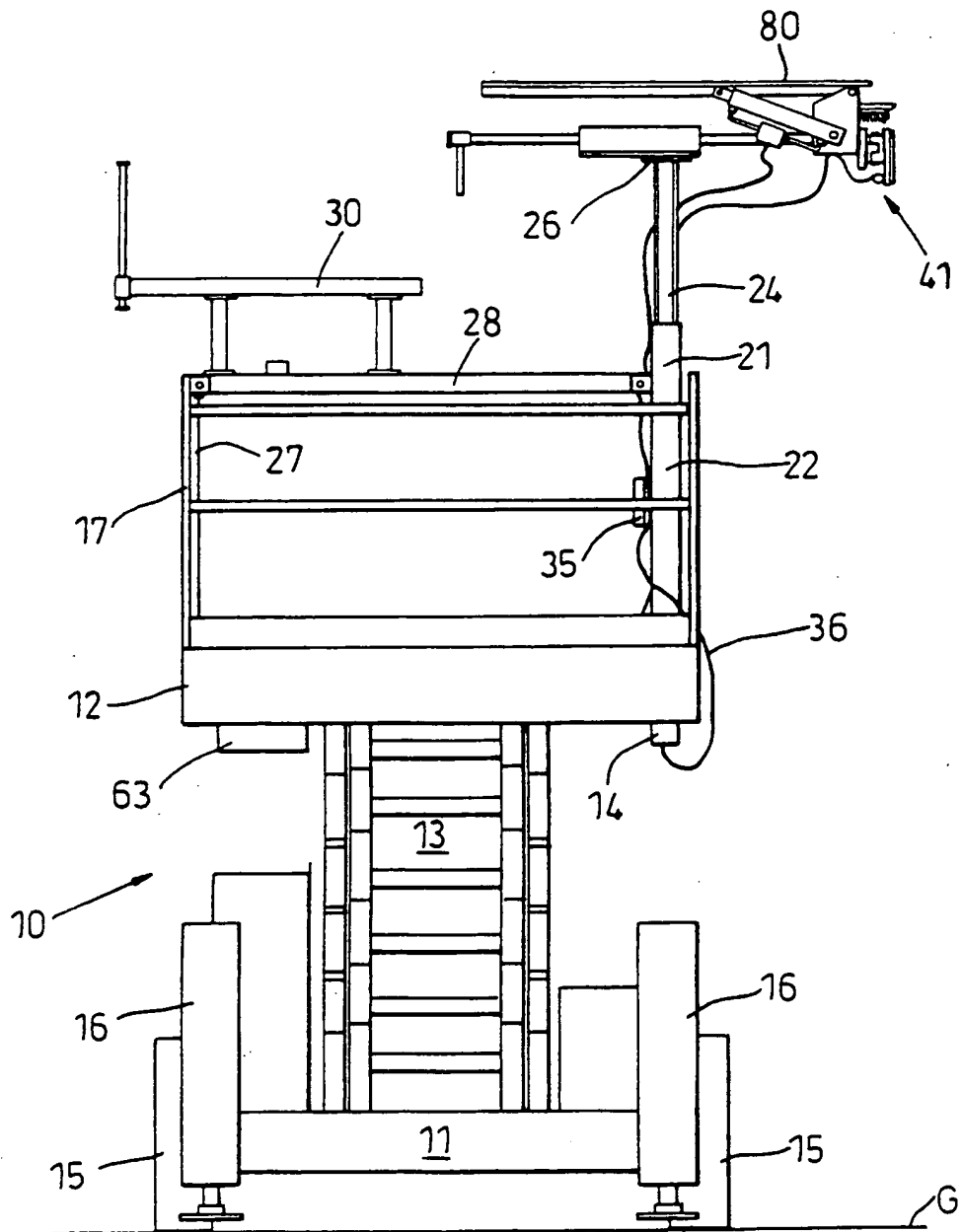
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*Fig. 1*

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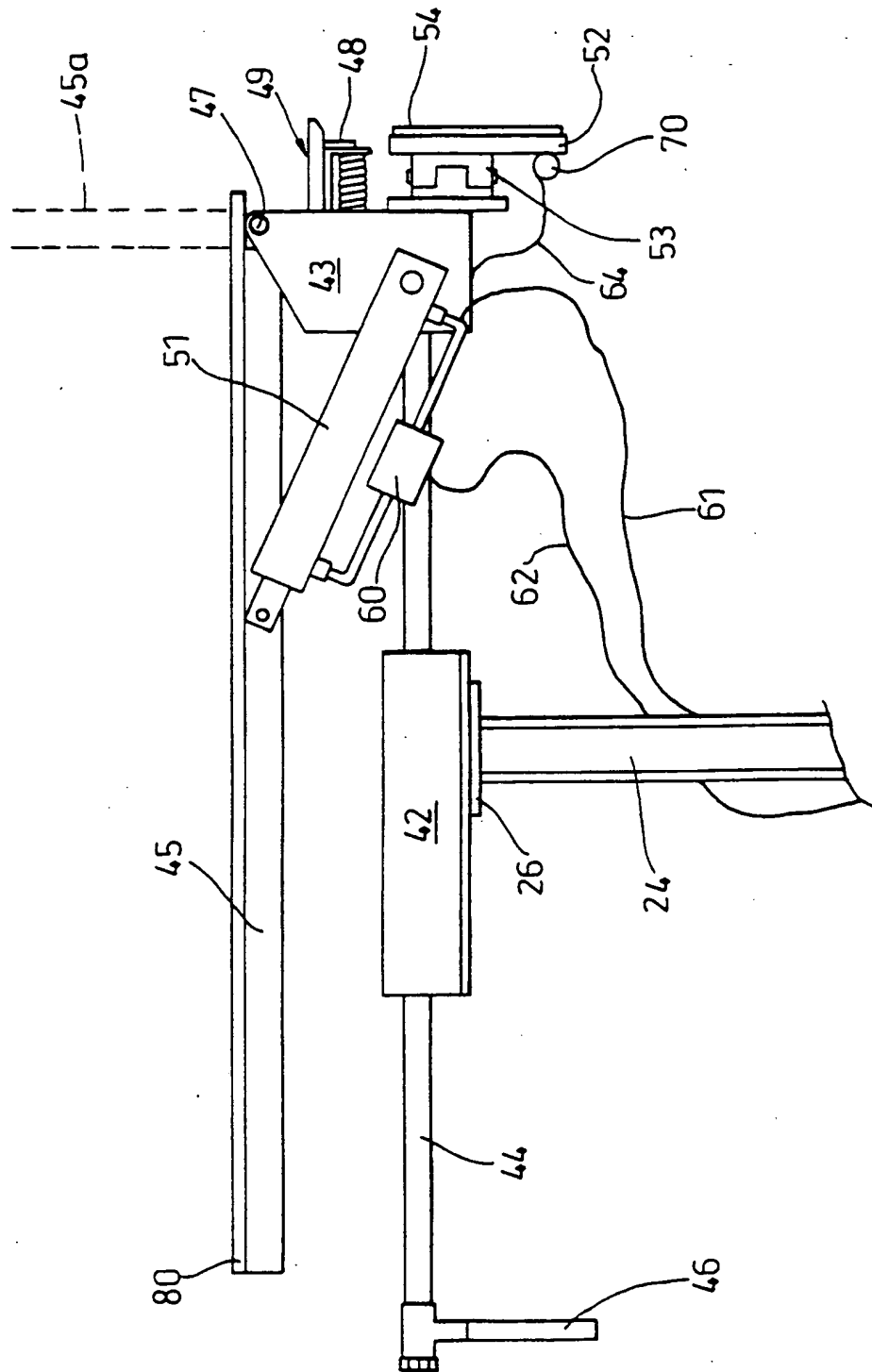
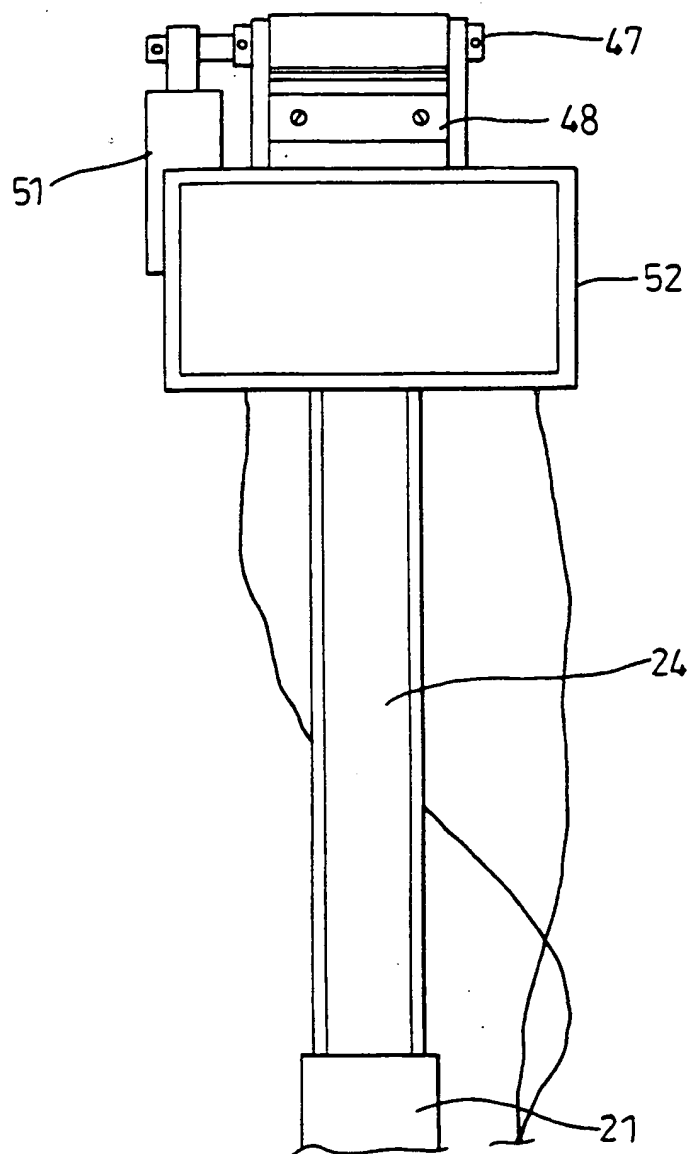


Fig. 2

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***Fig. 3***

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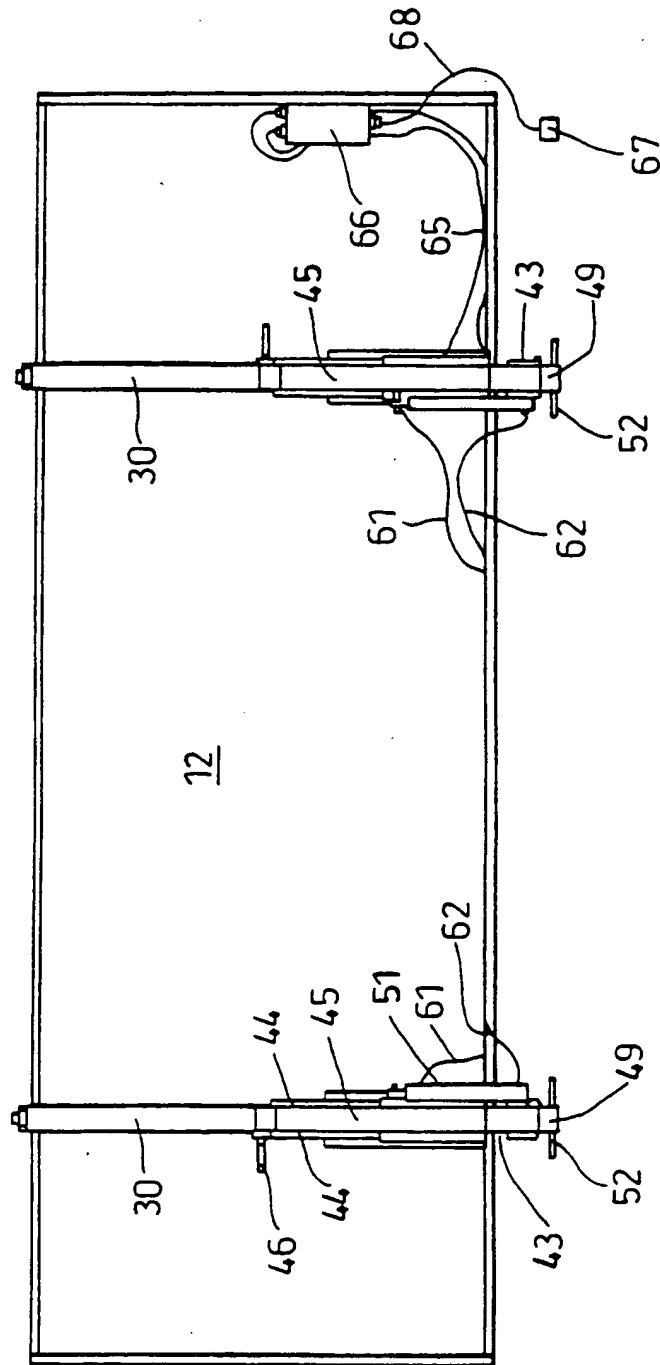


Fig. 4

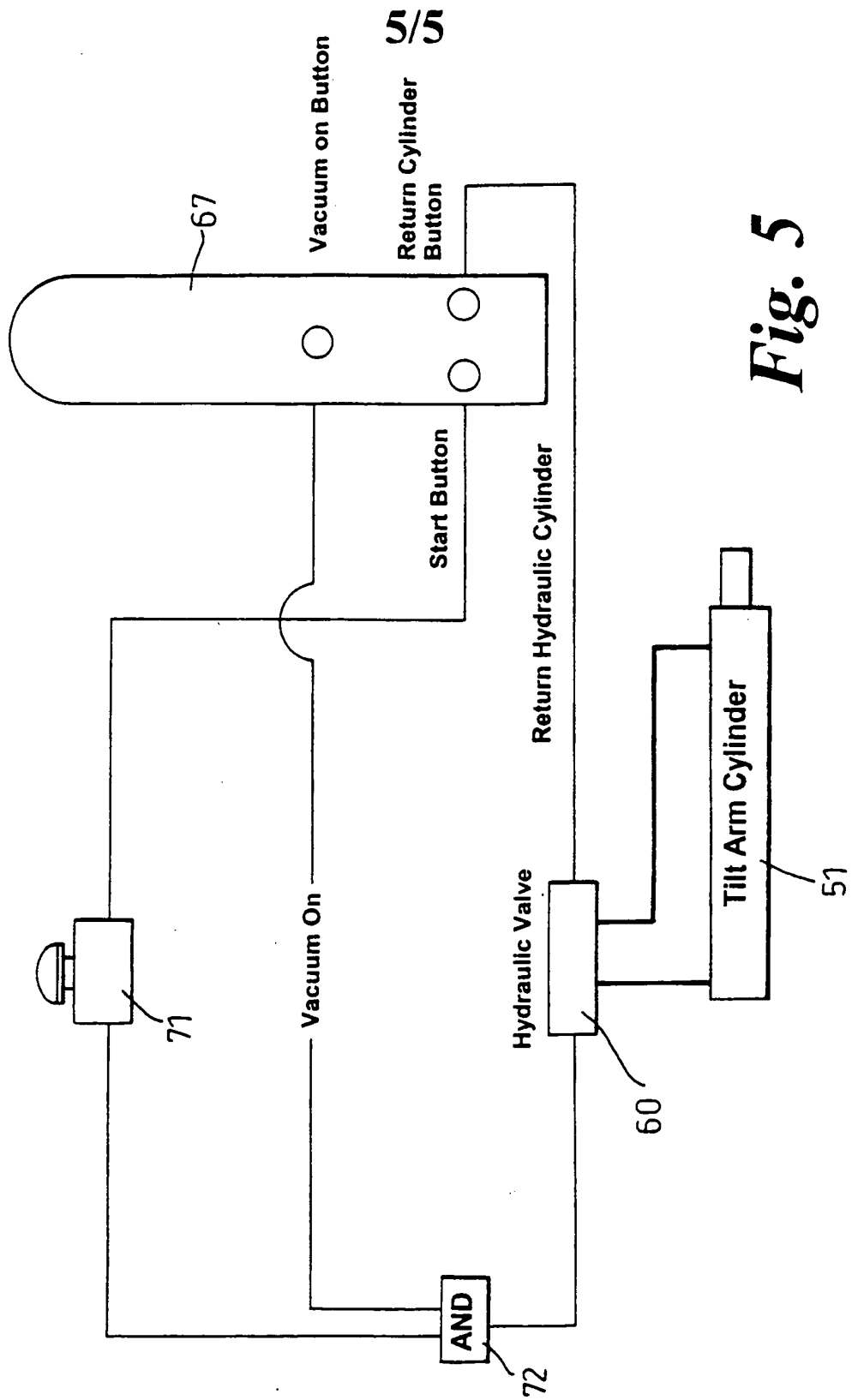


Fig. 5

Material Handling Apparatus

5 **Field**

This invention relates to material handling apparatus and in particular to apparatus used for lifting or supporting building materials.

10 **Background of the Invention**

Building construction sites for large buildings frequently employ construction equipment for lifting large and heavy components into position for fixing onto a building. Frequently, aerial lifts are employed for fixing building components at
15 positions high above ground level. A typical aerial lift is a mobile scissor lift available from JLG Ind. and which has a work platform which may be lifted into the air by a hydraulically operable scissor mechanism. For safety the work platform is surrounded by a safety barrier or fence.

20 These lifts may be provided with auxiliary material handling equipment which is secured to the platform for manoeuvring building materials into location onto a building.

Auxiliary equipment may be used for example in the locating and erection of
25 sheets of cladding onto the exterior surface of a building. Problems may arise when working on the face of a building, especially when an aerial lift is

fully extended due to the tendency for the work platform to move by small amounts relative to any fixed structure adjacent the lift. This problem may occur when an operator in the lift is working against the structure, for example when drilling into the wall or cladding on a building or when placing or pushing heavy cladding sheets into location.

The present invention provides auxiliary material handling apparatus that can be used on a work platform of an aerial and which is suitable for placement of cladding sheets against a building with minimal reaction against the work platform, and apparatus for stabilising a work platform.

Statements of Invention

According to the present invention, there is provided apparatus as defined in the appended claims, to which reference should now be made.

Description of the Drawings

The invention will be described by way of example and with reference to the accompanying drawings in which:-

Fig. 1 is front view of an aerial lift in a lowered condition and provided with sheet material handling apparatus according to the present invention,

Fig. 2 is an enlarged view of a sheet cladding handling device as is shown in Fig. 1.

Fig. 3 is a further view of the sheet cladding

handling device shown in Fig.2

Fig. 4 is a plan view of the lift shown in Fig. 1

and

Fig. 5 is a schematic drawing of the controls system for the apparatus according to the present invention.

Detailed Description of the Invention

With reference to Figs 1 to 4 of the drawings, there is shown an aerial lift 10 in the form of a self drive mobile scissor lift available from JLG Ind.. The lift 10 has a drivable vehicle body 11 that is mounted on wheels 15 and has a work platform 12 located on its body and which in use can be raised or lowered relative to the ground G. The platform 12 is shown in a lowered condition and the vehicle body is provided with stabilisers 16 at its corners which are lowered to provide stability during use of the lift. The work platform 12 is raised or lowered by a scissor type mechanism 13 typically operated by a powered hydraulic system provided on the lift. The hydraulic system is provided with a manifold 14 whereby hydraulic power may be taken from the powered system of the lift and used to operate the present invention. The platform 12 may include extendable end portions and the whole platform is provided with a safety barrier 17 formed from rails. An access ladder (not shown) is provided on the body 11 for access to the platform 12 when in the lowered condition.

The aerial lift 10 is provided with an auxiliary material handling apparatus which comprises a pair of spaced apart lifting devices 21 which are supported on the work platform 12 at opposite ends thereof. The two lifting devices 21 are substantially identical to each other are described in detail in the applicants co-pending application 0214834.4.

Each lifting device 21 comprises a substantially vertical hydraulic jack 22 having a reciprocable ram 24. The jack 22 rests on the platform 12 and the head of the ram 24 is provided with an adaptor plate 26 to which a sheet cladding handling device 41 is attached. The jack 22 is located to one side of the platform 12 and is secured to the inside of the barrier rail 17. A substantially vertical support leg 27, spaced from the jack 22, is located on the other side of the platform 12 opposite to the jack 22 and is also secured to the inside of the barrier rail 17. A substantially horizontal strut 28 extends between the jack 22 and leg 27 and is utilised to support a bracket 30 which can be used for storage of cladding sheets. The jack 22, strut 28 and leg 27 form a rigid frame which spreads any loads on the ram 24.

Each hydraulic jack 22 is operated through a hydraulic control means 35 which is fixed on the inboard side of the jack body 23. The two hydraulic control means 35 are each independently connected by flexible hydraulic hose 36 to

the manifold 14 for take-off of hydraulic power from the lift hydraulic system.

With reference in particular to Fig. 2, a sheet cladding handing device 41 is mounted to each adaptor plate 26 on the ram 24. The two devices 41 are substantially identical. Each apparatus 41 comprises a support 42 mounted on the plate 26 and a head 43 moveably mounted to the supports by at least one, and preferably a pair of bars 44 slidably mounted for reciprocating movement in the support 42. Each head 43 is displaceable substantially horizontally by manual means 46 on one of said bars which provides means for pushing and pulling the head 43 back and forth relative to the support 42. Alternatively, a hydraulic actuator may be provided which acts between the support 42 and head 43.

A tilting arm 45 is pivoted at one end thereof to a pin 47 on the head 43. On the outer vertical face of the head 43 opposite to the bar 44, there is mounted an abutment means 48 which is biased away from the head. A location pad 49 is mounted on the upper face of the abutment means 48 and projects slightly beyond the abutment means. A hydraulic actuator 51 is pivotally connected between the arm 45 and head 43 and is operable to move the arm 45 from a horizontal condition as shown to a vertical condition 45a shown in dotted outline.

On the outer face of each head 43 there is mounted below the abutment means 48, a vacuum pad 52 which is pivotally mounted to the head 43 by a vertical trunnion 53. Each vacuum pad has a closed cell foam seal 54 which enabled the
5 pad to grip on relatively rough surfaces.

A vacuum sensor 70 may be included in the vacuum line 64 to sense when a respective pad 52 is gripping against a surface. Each pad 52 may be provided with a non-return
10 valve which ensures that the vacuum remains in operation in the event of a failure at the vacuum source 63. The vacuum pads 52 are connected by flexible vacuum hose to a vacuum source 63 on the lift 10.

15 The hydraulic actuators 51 are connected via a control valve 60 and flexible hydraulic hose 61,62 to the respective hydraulic control means 35 64. The control means 35 is connected by electrical cable 65 to a control panel 66 which controls the operation of the hydraulic control
20 means 35 and vacuum source 63. The control panel 66 may also be operated through a remote pendulum set 67 which is connected to the panel 66 through electrical cable 67. The vacuum source is driven by power sources on the body 11 of the lift.

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Referring to Fig.5, the two hydraulic jacks 22 can be individually or jointly operated from the control panel 66

or pendulum set 67. The hydraulic actuators 51 and vacuum pads 52 can also be likewise controlled from the panel 66 or pendulum set 67. The control system includes a stop button 71 arranged on the strut 28 which as shown in Fig 5 is arranged so that actuators 51 may only be activated if the stop button is manually held in an "ON" condition. The control system also includes an AND gate 72 connected to the vacuum control on the pendulum 67 or control panel 66. The AND gate 72 permits operation of the actuators 51 only when the stop button 71 is depressed and a suitable vacuum level is detected by sensor 70. The hydraulic actuators 51 are operable only when the scissor lift is in a stationary condition.

In use, the lift platform 12 is raised to approximately the necessary height for fixing a cladding panel. A cladding panel 80 is laid substantially horizontally across the two arms 45. The heads 43 are moved towards the panel location and the jacks 22 can be displaced over a limited height range to align a pad 49 on each head 43 with the upper edge of a previously located panel. The head 43 is then pushed outwardly so that the abutment 48 sits against the side of said previously located panel and the pad 49 rests on the edge. Simultaneously, the suction pads 52 also seal against the previously located panel and vacuum is applied so that the pads 52 grip said previously located panel.

If the vacuum sensor 70 confirms that the suction pads are operable, the two actuators 51 are then operated to lift the panel 80 to a vertical orientation with the lower edges of the panel 80 resting on the upper surface of the pads 49. The cladding panel is moveable sideways for any final alignment whilst sat on the two pads. Since the operator on the platform must keep the button switch in an "ON" condition there is no possibility of said operator trapping finger between upper and lower panels and the head 43 is then slightly withdrawn to remove the pads 49 from between vertical sheets and the panel then drops into its final location. The hydraulic actuators 51 keep the panel vertical and it is secured in location by necessary drilling and fixing.

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Since the pivot 47 is close to the location of the panel, there is minimal reaction force transferred back to the platform 12 as the actuators 51 push the panel into location. The platform stability is also improved by the pads 52 gripping against the lower panel.

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Alternatively to the above embodiment, the apparatus 41 may be secured in a fixed vertical location relative to the platform. Furthermore, to form a platform stabilisation system, only the vacuum pads 52 need be provided on the head, preferably in combination with a resiliently loaded abutment.

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Claims

1. Sheet cladding handling apparatus to be used in combination with an aerial lift having a work platform, the apparatus comprising a pair of spaced apart sheet handling devices each of which comprises: a support mountable on the work platform, a head slidably mounted on the support for substantially horizontal displacement, an arm having one end portion connected by a pivot on said head for movement between substantially horizontal and vertical conditions, an abutment means on the head adjacent the pivot, at least one vacuum pad attached to said head below the abutment means and connected to a vacuum source to be operable to grip onto a surface of a building and a first actuator pivotally interconnected between the head and arm to rotate the arm relative to the head, such that sheet cladding supported across said arms can be raised from a substantially horizontal condition to a substantially vertical condition, and is displaceable horizontally relative to the platform by movement of the two heads relative to their supports.
2. A material handling apparatus as claimed in Claim 1, wherein the abutment mean is resiliently biased away from the head.
3. An apparatus as claimed in Claim 2 wherein abutment means has one face which in use contacts a surface of the building and a second face which in use supports a cladding panel.
4. Apparatus as claimed in Claim 3 wherein the second face has a projection which in use locates on the top edge of a previously mounted cladding panel.
5. Apparatus as claimed in any one of Claims 1 to 4, wherein each first actuator is a hydraulic actuator and the two actuators are linked to a hydraulic control means.

6. Apparatus as claimed in any one of Claims 1 to 5 wherein each head is slidably mounted to the support by at least one bar.
7. Apparatus as claimed in Claim 6, wherein a further hydraulic actuator is operable between the support and head for displacement of the head relative to the support.
8. Apparatus as claimed in any of Claims 1 to 7 wherein each vacuum pad has a closed cell foam seal which in use seals against the building.
9. Apparatus as claimed in Claim 8 wherein the vacuum pad is pivotally mounted to said head.
10. Apparatus as claimed in Claim 9, wherein the vacuum pad is pivotally mounted by means of a vertical trunnion.
11. Apparatus as claimed in any preceding Claim, wherein the apparatus further includes a sensor for sensing when the vacuum pad is gripping against the building and electrical controls which permit operation of the first hydraulic actuators only when the vacuum pad is gripping.
12. Apparatus as claimed in any preceding Claim, wherein the vacuum pad is supplied with vacuum via a non-return valve.
13. Apparatus as claimed in Claim 12 and further including manual switch means which are biased to an off condition, the switch means being manually operable against the bias to an on-condition, to permit operation of the head actuators.
14. An aerial lift having a work platform surrounded by a safety barrier, and further including apparatus as claimed in any one of Claims 1 to 13.

15. An aerial lift as claimed in Claim 14, when depending from claim 5, the lift being a mobile self drive lift having a platform which is raised by a powered hydraulic system, wherein said hydraulic control means are connected into the powered hydraulic system of the lift.

16. Sheet cladding handling apparatus, substantially as described above, with reference to the accompanying drawings.

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